# NASA Activities

National
Aeronautics and
Space
Administration

**Vol. 9, No. 8**
**August 1978**

## Cover

**One of a Kind**—A $27 million modification program at the Boeing plant in Seattle gave a twin-prop de Havilland of Canada "Buffalo" aircraft a new wing, tail and avionics and four overwing jet engines to provide "upper surface blowing" for high lift. Shown on its first flight, the QSRA (for "Quiet Short-haul Research Aircraft") is designed to demonstrate very high lift and quiet operation. NASA's Ames Research Center is responsible for the development of the experimental unique aircraft. The purpose of the program is to develop technology for quiet short-haul commercial airliners of the future with short takeoff and landing capabilities, and to explore operating procedures of such an airplane in the environment of airport terminals. After two months of initial flight testing at Boeing, the QSRA will be flown to the Ames center for two years of additional testing.

NASA Activities is published monthly by the National Aeronautics and Space Administration for the information of the Agency's employees.
Contributions and recommendations are solicited from headquarters and field centers, and should be addressed to the Office of Public Affairs, Code LFD-10, Washington, D.C. 20546.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
Annual subscription rate: $11.55 domestic; $14.45 foreign.
Price per single copy: $1.00 domestic, $1.25 foreign.
Back issues not available.

Ann Weeks
Editor, Code LFD-10
NASA Headquarters, FOB 6
Washington, D.C. 20546
(Phone: 202 755-8348)

## Table of Contents

Meteorite Fragment Confirmed as Rare ..... 3
Course Change Made on Pioneer Venus 1 ..... 4
Astronaut Candidates Report to Houston ..... 4
Scientists Offer New Answer to Old Puzzle .... 4
Comstar D–3 Launched ..... 6
Explorer 52 Declared a Success ..... 6
Seventeen Space Processing Contracts Signed .. 7
New Science Post Filled ..... 7
Notice to Readers ..... 7
Space Beam Builder Demonstrated ..... 8
Eight Rockets Launched in U.S./U.S.S.R. Project ..... 9
Jupiter Probe under Development ..... 9
Aquatic Plants Continue to Show Promise as Water Purifiers ..... 10
New Director for Dryden Flight Research Center ..... 12
Associate Deputy Administrator Appointed .... 13
Honors Awarded 37 NASA Headquarters Employees ..... 13
Booster Tested in Airdrop ..... 13
Crow Announces Departure Plans ..... 14
Smithsonian Scientist to Advise President Sadat ..... 14
Impaired Employees Get a Break ..... 15
Langley Man to Work with State Education Program ..... 16
Contractor News ..... 16
Did You Know? ..... 17
Patents for Inventions ..... 18
Launches for 1978 ..... 18
Another Dividend from Air and Space ..... 20

## Meteorite Fragments Confirmed as Rare

Scientists working for NASA and the Smithsonian Institution have confirmed that a meteorite found last winter in the frozen reaches of the Antarctic is one of the rarest types known.

The meteorite fragment, which has not yet been named, was found by Dr. William Cassidy of the University of Pittsburgh, while on an expedition sponsored by the National Science Foundation. Called a carbonaceous chrondrite because of its high carbon content, the rare meteorite was found with what is believed to be another similar sample and with about 300 other specimens.

The fragment was examined by a team of experts at NASA's Johnson Space Center earlier this month. The team consisted of Dr. Everett Gibson, Johnson center geochemist; Dr. Carleton Moore, Director of the Center for Meteorite Studies at Arizona State University; and Dr. Elbert King, University of Houston Geology Department. The examination took place with the meteorite inside a lunar-type glove box flushed with dry nitrogen gas. A low-power microscope was used for the initial examination that confirmed the carbonaceous nature of the specimen.

Studies of fragments from this meteorite sample are expected to shed more light on the processes of chemical and physical evolution that may have taken place during the early history of the solar system, and to enhance our knowledge of the regularity of this evolution in other planetary systems.

Dr. Brian Mason of the Smithsonian Institution, Washington, D.C., a leading expert on meteorites was sent an 0.4 gram sample from the meteorite fragment. By carefully examining a paper-thin slice of this chip under a high-powered microscope, Mason was able to observe additional details of the specimen.

The carbonaceous chondrite which was examined is a 19.91-gram sample about the size and shape of a small egg, colored charcoal gray with slight olive green cast. The interior consists of a fine-grained dark gray matrix with about two to three percent of crystalline inclusions called chondrules.

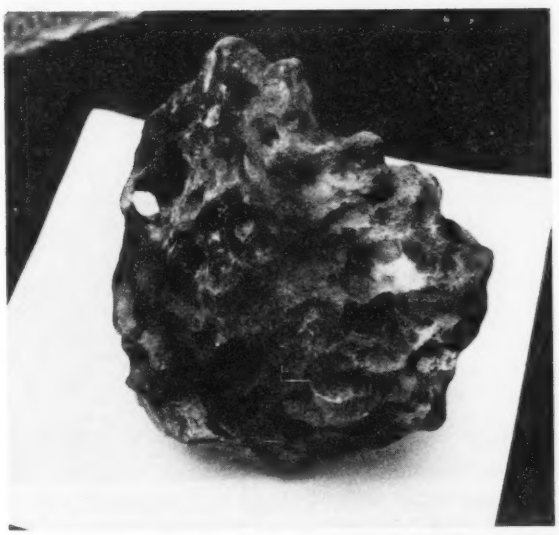
The meteorite fragment is a Type 2 carbonaceous chondrite. Fifteen other Type 2 samples have been collected before, but none were in as clean a condition and as well preserved. Such carbonaceous chondrites have previously been shown to contain amino acids of a non-terrestrial origin. That suggests that the chemical formation of the complex organic molecules necessary for life may be found in other regions of our solar system. Carbonaceous chondrites, like other meteorites, are some four and a half billion years old and preserve a record of how the solar system was formed at that early time.

The Johnson center is providing special handling and curatorial service for the meteorite collection because the fragments were found preserved on the cold, sterile Antarctic ice cap in what has been called the "cleanest condition under which meteorites have been recovered." The constant cold and extremely dry air are thought to have kept the samples in a near pristine state, without destroying any of the valuable scientific information that they contain.

Subsequent analysis will begin after the meteorite fragments have been carefully described, sliced into smaller pieces and fully documented, in a process carried out at the new meteorite processing laboratory at the center. Samples will be sent to the investigators as soon as possible after characterization for further detailed examination.

A special newsletter covering the processing and documentation of the samples is being prepared by center's lunar and planetary science curatorial staff, and will be distributed periodically to researchers in the field.

It is also expected that the Cassidy team will pursue its meteorite search again this winter in the Antarctic.



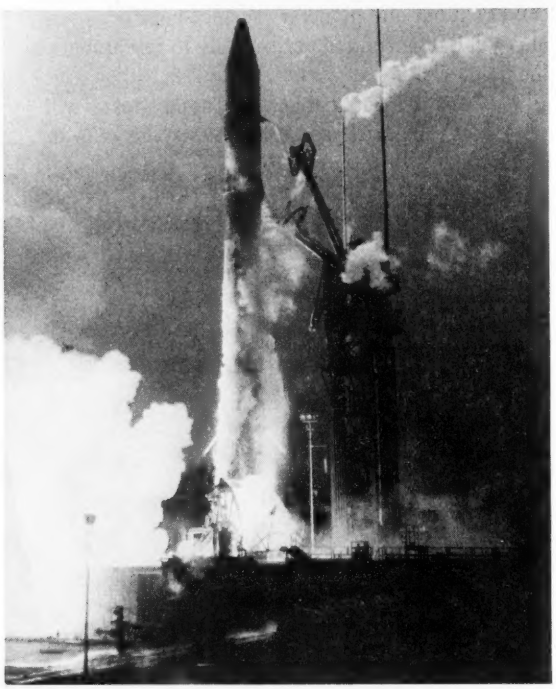
**It's Carbonaceous and Rare**—This fragment of a rare type of meteorite was examined inside a Johnson Space Center glove box filled with dry nitrogen gas. The fragment, about the size and shape of a small egg, was found recently in the Antarctic.

## Course Change Made on Pioneer Venus 1

Spacecraft controllers completed a Pioneer Venus 1 midcourse correction maneuver, enabling the spacecraft to reach the required point for injection into orbit at Venus, 348 kilometers above the planet in the northern hemisphere. Pioneer Venus 1 will reach Venus in December.

The change in flight path is expected to allow Pioneer Venus 1 to enter its planned long oval orbit, tilted 75 degrees to the equator of the cloud-shrouded planet. Closest approach on this orbit will be 290 km from Venus and greatest distance 65,970 km.

Spacecraft directors at NASA's Ames Research Center, which manages the Pioneer project, said the spacecraft appeared to have performed the required three-segment, trajectory-changing burn correctly. The maneuver required eight hours and rocket thrusts in two directions in space. About two weeks of spacecraft tracking will be needed to determine the accuracy of the course change.



**To Inspect Venus**—NASA's Pioneer Venus-1 as it lifted off from the Cape Canaveral complex 36 on May 20, enroute to planet Venus. Scheduled to arrive at its destination Dec. 4, the spacecraft will go into orbit around the planet and begin monitoring phenomena of the Venusian atmosphere. A companion spacecraft, Pioneer Venus-B, was launched to Venus Aug 7.

Pioneer Venus 1 will be the first U.S. spacecraft to go into orbit around Venus. Along with the five Pioneer Venus 2 probes which will descend into the atmosphere, it will have a major part in NASA's exploration of Venus next December. The purpose of these missions is to make a detailed study of Venus and especially to profile the planet's very simple weather machine. Scientists think this may help us understand Earth's complex weather and climate.

At the time of this report, the spacecraft was about five million km from Earth, traveling toward Venus at about 16,000 km/h.

## Astronaut Candidates Report to Houston

Thirty-five new astronaut candidates reported to the Johnson Space Center on July 10, to begin a two-year training and evaluation period.

Activities scheduled in July and August included aircraft life support ejection seat training for the T–38 aircraft, aircraft physiological training, T–38 systems and operations, and a trip to Homestead Air Force Base in Florida for the standard Air Force water survival course given by USAF instructors. In subsequent weeks, the candidates will attend lectures on the history of space flight, technical assignment methods and procedures within the astronaut office, lessons on manned spacecraft engineering, Space Shuttle program, aerodynamics, flight operations and the many disciplines associated with preparation for and operation of vehicles in space.

## Scientists Offer New Answer to Old Puzzle

Scientists working for NASA apparently have discovered a way to account for the formation on Earth four billion years ago of nucleic acids, one of the two most essential building blocks of life. The discovery supplements earlier work in which the same investigators discovered a mechanism to explain the formation of the other critical building block, protein. Taken together, the findings provide an answer to a vital question that for years has puzzled theorists on the chemical evolution of life on our planet.

Basically, the mystery has been: How could the building blocks of life—randomly scattered on the shores of primitive oceans—be continuously collected and organized over millions of years in high enough concentrations to produce living organisms?

The scientific team that conducted the investigations at NASA's Ames Research Center consisted of Dr. James Lawless, team leader at Ames; Dr. Edward Edelson, a National Research Council Fellow; and Lewis Manring, a student at the University of Santa Clara.

The explanation involves substances that would have been common on the shores of Earth's primitive oceans—metal clays. When low concentration solutions of DNA-forming nucleotides were mixed with commonplace metal clays, most clays attracted the DNA, the Lawless team found. (The very long DNA nucleic acid chain in every living cell contains a blueprint of the entire organism.)

One type of metal clay, containing zinc, preferentially attracts all six of the building blocks of DNA and RNA (nucleotides). Especially significant is the fact that zinc clay attracted 97 percent of nucleotide five-prime-adenosine monophosphate (AMP). AMP is the most common DNA building block in living systems. In addition, AMP is the essential precursor to ATP, the basic energy molecule, present in every life form.

The role of zinc-clay is especially interesting because zinc plays an important role in the enzyme, DNA polymerase, which performs the task of linking DNA building blocks (nucleotides) in living cells. Enzymes are super catalysts, that drastically speed up many life processes.

The work appears even more significant in light of earlier results from the Lawless group, which show that metal clays could effectively concentrate amino acids, the building blocks of proteins and could catalyze their reaction to form polypeptide chains, the basic structural units of proteins. In addition, it was found that certain metal-clays could preferentially attract those amino acids found in the protein of living things today.

Most scientists accept the theory that life began by chemical evolution on the shores of primordial bodies of water. The theory says that various forms of energy such as lightning, heat and ultraviolet radiation converted the abundant carbon-containing methane, ammonia and water of the primitive atmosphere into building blocks of life (organic molecules). These molecules, according to the story, then rained into the primeval bodies of water and joined together into ever-more complex molecules until a molecule or group of molecules appeared which could replicate itself. Thus the first living thing came into existence.

In recent years, many scientists have performed a large number of chemical evolution experiments. These have produced most of the basic life molecules (including amino acids and nucleotides) in small quantities, by applying electric discharges or other energy release to ammonia, methane and water vapor. But until now, scientists have been unable to explain how the life-building blocks in the primordial waters were organized.

The group is performing additional experiments to see if the zinc-clay preference for the "life-form" of this DNA building block applies to the five others. They are also trying to demonstrate the ability of clays to link nucleotides into polynucleotides, the next step toward forming a DNA-like molecule.

The work was explained by team member Edelson on June 15 at the 33rd annual northwest regional meeting of the American Chemical Society in Seattle.

---

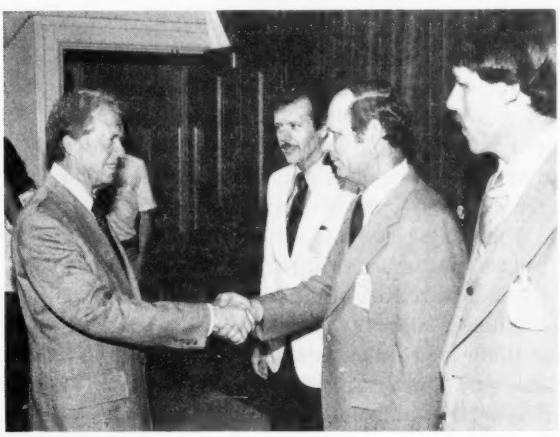


**Image Display System Demonstrated**—President Carter greets Goddard Space Flight Center personnel at a White House demonstration held in June of a new concept in quick information displays. Shaking hands is Goddard Deputy Director Ed Smylie. Others are John Quann (left) and John Dalton (right). The Goddard team, in cooperation with the Commerce Department's Bureau of the Census, showed how reams of statistics on such subjects as housing and education can be translated within seconds into full-color, easy-to-read images depicting national trends. The conversion is made possible by linking any remote data terminal by microwave to Goddard's computerized image-display system, used normally for converting satellite data. Other special showings were held for members of Congress.

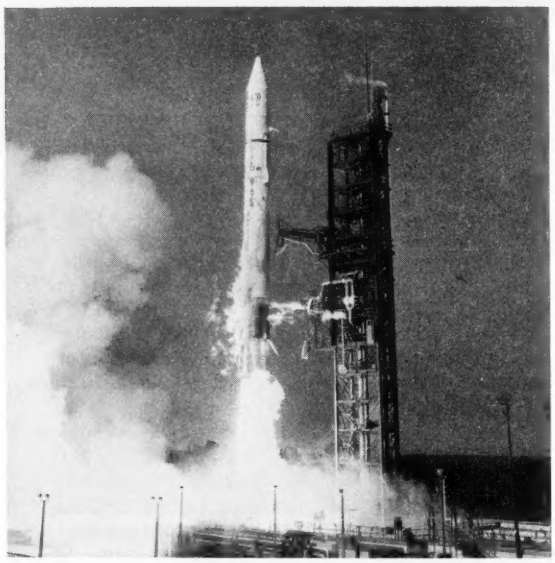
## Comstar D–3 Launched

NASA's Kennedy Space Center successfully launched the Comstar D–3 high-capacity satellite for U.S. domestic telephone communications June 29 from launch complex 36 at Cape Canaveral. The launch vehicle was an Atlas Centaur. NASA will be reimbursed for the launch by the Comsat General Corp., Washinbton, D.C. The launch cost about $47 million—$21 million for the satellite and $25 million for the launch vehicle and related services.

NASA's launch team was responsible for placing Comstar D–3 in a highly elliptical transfer orbit with an apogee of 35,788 kilometers and a perigee of 547 km. Tracking and commands to the spacecraft were NASA's responsibility until a transfer orbit was achieved. Thereafter, the Comsat General System Control Center assumed control and tracking functions, and issued the command firing the satellite apogee kick motor, circularizing its orbit at the correct altitude.

Comstar D–3 has a design life of seven years. Height of the spacecraft is 610 centimeters; diameter is 244 cm; and weight in orbit is 792 kilograms.

The Lewis Research Center was responsible for the Atlas Centaur development and operation; the Kennedy center handled vehicle checkout and launch.

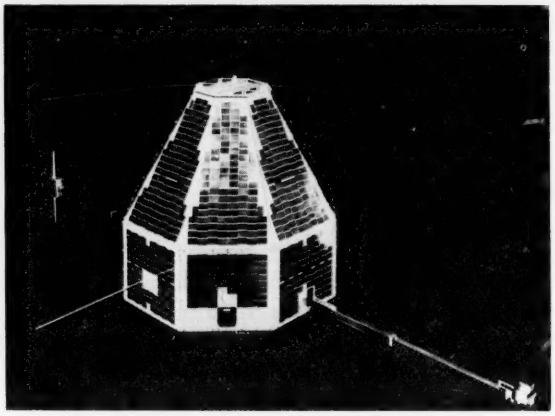


**Comstar D–3 Heads for Orbit**—Atlas Centaur 41 lifts off from complex 36, Cape Canaveral, with Comsat General Corporation's Comstar D–3, third in a series of domestic communications satellites to be launched by NASA for Comsat. The launch took place June 29.

## Explorer 52 Declared A Success

Explorer 52 (Hawkeye 1), launched June 3, 1974 has been adjudged successful, on the basis of results to date. The assessment was approved by Noel W. Hinners, Associate Administrator for Space Science on June 23, 1978.

The NASA Hawkeye mission objectives were to study the plasma properties of the magnetosphere in the vicinity of the magnetic neutral point over the Earth's north polar cap. To date, 19 papers based on Explorer 52 findings have been published and 20 papers have been presented at various national and international scientific meetings. The spacecraft reentered the atmosphere April 28, 1978.



**It Did its Job Well**—Explorer 52 (Hawkeye 1) has been declared an official success after four years of measuring properties of the Earth's magnetosphere. It was launched from the Western Test Range in 1974 into an elliptical orbit with a perigee of 470 kilometers and an apogee of 125,000 kilometers.

In the four years since launch, Explorer 52 performed particles and fields investigations of the polar magnetosphere of the Earth out to large radial distances, magnetic field and plasma distribution measurements in the solar wind, and detection and direction-finding measurements on certain radio emissions occurring in the outer solar corona.

Data acquisition and spacecraft command and control was performed primarily from the North Liberty Radio Observatory at the University of Iowa station. Additional support was obtained from NASA/STDN stations, the French station, (Terre Adelie) at the magnetic South Pole, and the German station at Weilheim in conjunction with perihelion passes of Helios 1 and 2.

Explorer 52 direction finding measurements were used in combination with other spacecraft (1MP, Helios) to determine the trajectories of source particles of Type 111 solar radio bursts. Because the electrons which produce these bursts follow the magnetic field in the interplanetary medium, the measurements provide unique new "remote sensing" information on the structure of the magnetic field out of the ecliptic plane.

## Seventeen Space Processing Contracts Signed

Improved medicines, electrolyte materials for higher-capacity, small-size batteries, and larger, more perfect crystals for electronic applications are among a long list of products expected to evolve from materials processing in space research.

Seventeen scientists signed contracts recently with the Marshall Space Flight Center to develop these and other materials experiments, to be among the first conducted in the weightless environment offered by the Space Shuttle and Spacelab.

The $12 million program, covering five years, is expected to demonstrate the value of space for materials work by showing significant scientific results in the development of specific useful materials and products. The continuing program is intended to develop space materials science and technology in both research and manufacturing activities leading to privately funded materials processing in space.

Inasmuch as routine fiights into space are scheduled to begin next year, scientists will have many opportunities to investigate materials processes that cannot be accomplished on Earth because of the force of gravity.

Five of the 17 scientists will have an opportunity for a preliminary flight of their experiments in a materials experiments assembly package on an early orbital flight test of the Space Shuttle. This flight will not only produce valuable scientific data, but will determine whether further refinement of the experiments and hardware is needed before the first flight on Spacelab or Space Shuttle.

Four of the experiments will be flown again, along with five others, on a Space Shuttle satellite deployment mission. The fifth one will be flown again on the third Spacelab mission, a mission devoted almost entirely to materials processing in space. Four more of the scientists will have experiments on this mission.

## New Science Post Filled

Dr. Adrienne F. Timothy was named Assistant Associate Administrator for Space Science at NASA, effective June 18, 1978. In her new post, Timothy serves as the chief scientist for the Office of Space Science, the focal point for obtaining, evaluating and utilizing the expertise of the scientific community in the planning of the OSS programs. She succeeds Dr. S. Ichtiaque Rasool, who was named chief scientist for NASA's office of Space and Terrestrial Applications. She reports to Dr. Noel S. Hinners, Associate Administrator for Space Science.

Timothy began her career with NASA in 1974 as the staff scientist for solar physics, physics and astronomy programs in OSS. She had major responsibility for assuring that the scientific objectives of the Apollo Telescope Mount project and of the Solar Physics Shuttle and Spacelab programs were met. In 1975, she became chief, solar physics branch, and in 1977 program manager for advanced programs and technology in NASA's solar terrestrial division of the Office of Space Science.

In the latter position Timothy was responsible for the formulation of a long-term program of solar terrestrial research, based on current science studies and requirements and the availability of necessary technology.

Timothy, born in Caterham, Surrey, England, earned a B.Sc. in physics at University College, London, in 1964 and a Ph.D. in space science at the same university in 1971. She was employed by American Science and Engineering Corp. from 1971 to 1974.

## Notice to Readers

A number of inquires have been received from field personnel requesting information on how to submit material to the publication. The preferred mode of handling such material, covering awards, promotions, and the like, is for an individual or office to send the information through its center public information office to NASA *Activities*.

## Space Beam Builder Demonstrated

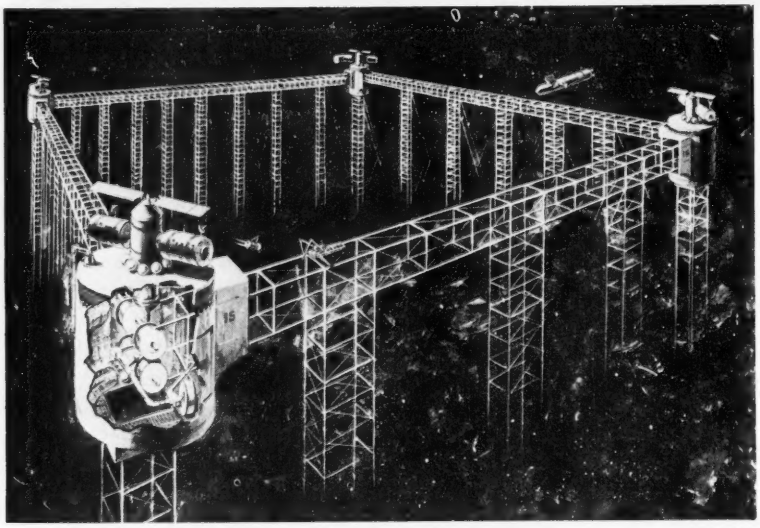
A tool that might be used for building huge space structures stretching over many square miles in Earth orbit was put on public display in June by the Grumman Aerospace Corp. in Bethpage, N.Y.

The automated beam builder, designed and built by Grumman for NASA's Marshall Space Flight Center, could manufacture construction beams from thin sheets of aluminum transported into space by the Space Shuttle. Rolling out a 12.19-meter-long aluminum beam served to demonstrate how the beam builder will be employed in the space program. It is one of the first pieces of construction equipment that will be used in the Shuttle system.

This test device will be used at the Marshall center in hopes of proving the concept of building beams in the hostile environment of space. At the completion of testing, plans call for modifying the machine, making it considerably lighter than the test article (7,257 vs. 9,979 kilograms). The lighter version can be taken into orbit by the Space Shuttle.

When the 18-by-10 m machine is mounted in the cargo bay of the Shuttle orbiter, it will provide the basis for construction of large and varied structures. The machine uses four-mm thick aluminum, and produces beams weighing .38 kg per 130 m.

By loading the beam builder with a single supply of three rolls of aluminum, it can produce a one-m beam, 305-m long. Easily reloaded, such a machine can manufacture beams of unlimited length.



**Space Builder**—An artist's concept of how a beam builder (shown in detail at lower left) would operate in space, It is shown constructing a satellite solar-power station, a concept that stems from studies being done to determine ways of harnessing the Sun's energy to support industry and life on Earth. Spools of aluminum and other raw construction material are automatically fed out, producing the structural beams. Cylindrical chambers on top of each module provide housing for work crews. A heavy lift launch vehicle parked at upper right theoretically could carry 400,000 pounds of construction material into low Earth orbit.

**Vibration Test Turn-on**—A ground vibration test engineer sits at the control panels of the computerized system which applies vibrations to the Space Shuttle test articles. The Space Shuttle orbiter and external tank are suspended inside a Marshall center test stand for the important series of tests. The engineer is David Mann, a Marshall employee.

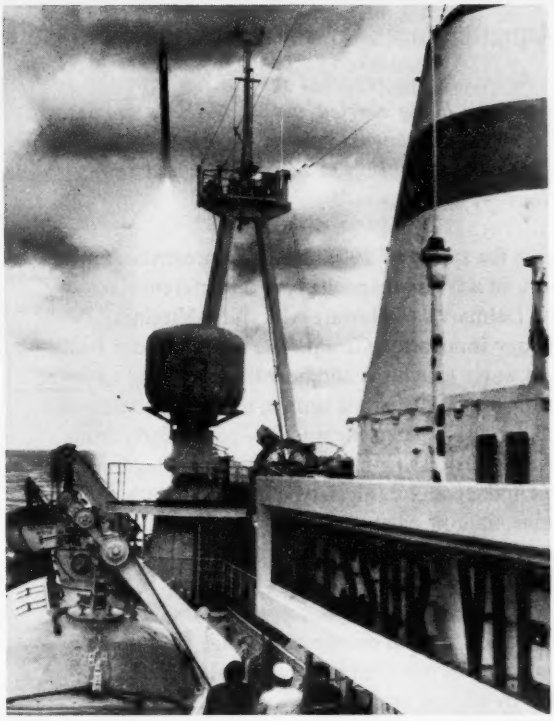
## Eight Rockets Launched In U.S./U.S.S.R. Project

Eight rockets were launched in June from NASA's Wallops Flight Center, Wallops Island, Va., and the offshore Soviet research ship, *Professor Vize*.

The launchings, part of the Joint American-Soviet Particle Intercalibration Project, were designed to investigate ionization sources in the upper atmosphere during geomagnetic activity and to compare U.S. and Soviet particle measuring instrumentation. Complementary measurements were also made using satellite, aircraft and ground-based instrumentation.

Three of the eight were American rockets launched from Wallops and the remaining five were launched from the *Professor Vize*. Ionosonde measurements were made from Wallops Island, radar ionospheric measurements were made from Millstone, Mass., and airglow measurements were made from Wallops and Arecibo, Puerto Rico. Scientists sought an opportunity to launch after a solar flare and during the intense magnetic storm which usually follows such an event.

Cary F. Milliner, Jr., was the Wallops center project manager and Dr. Fred A. Morse of Aerospace Corp. was the project scientist. Dr. G. S. Ivanov-Kholodniy was the Soviet project manager and Dr. S. I. Avdyushin was the Soviet program scientist.



**Waterborne Launcher**—The Soviet research vessel, *Professor Vize*, serves as the launch pad for an MR–12 solid propellant rocket offshore Wallops Island.

## Jupiter Probe under Development

Hughes Aircraft Co., Space and Commuications Group, El Segundo, Calif., has been selected by NASA for negotiations leading to a contract for the development of a Jupiter atmospheric entry probe as part of the Galileo mission to be launched from the Space Shuttle in January 1982.

Hughes will design, develop and fabricate the protoflight probe, integrate the science instruments and test and provide systems integration and launch support. This approach, in which the development testing is conducted with the flight hardware, was recently used by NASA's Ames Research Center in the development of Pioneer Venus 2, a multiprobe spacecraft launched toward Venus in August.

The Galileo mission is composed of an orbiter which will circle the planet for 20 months, and a probe which will plunge into Jupiter's atmosphere. The probe, designed to withstand the high speed entry of 48 kilometers per second (20,000 miles per hour), will provide information on Jupiter's composition, structure and cloud physics as it descends to a pressure of more than 10 Earth atmospheres.

The mission is a cooperative project between NASA's Jet Propulsion Laboratory and Ames. JPL has overall project management responsibility including orbiter development, while Ames will manage the probe system, which will carry six scientific instruments. Project Galileo also involves the cooperation of the Federal Republic of Germany, which has agreed to provide the orbiter retropropulsion motor and some of the science instruments.

Hughes has estimated cost for the contract at about $35 million. A large portion of the work will be performed under a subcontract with the General Electric Co., Reentry Systems Division, Philadelphia, Pa. A bid also was submitted by McDonnell Douglas Astronautics Corp., East St. Louis, Ill.

## Aquatic Plants Continue to Show Promise as Water Purifiers

*Activities has reported several times in the past on the progress of scientific research concerning water hyacinths being carried out at NASA's National Space Technology Laboratories in Mississippi since 1974. Recent developments related to the program—called the vascular aquatic plant project—show a considerable amount of expansion in both results and country-wide interest in the potentials of the plant as a natural water filtration system.*

In the spring of 1978, NASA representatives took part, in advisory capacities, in a conference held by the Delmarva (Delaware-Maryland-Virginia) Technology Innovation Group. The subject under study was water hyacinths and how these floating vascular plants might become a simple, efficient and economical disposal system for wastes—particularly from poultry processing in Delmarva sewage lagoons.

Unlike cellular, algal-type aquatic plants, a vascular plant has a specialized system for channeling and storing fluids and certain tissues, cells, and fibrous elements.

The Delmarva conference was well-attended by area poultry plant managers, sewage plant personnel, and persons involved in the control of water pollution by sewage and sewage control. The conference had been preceded by several months of experimentation at NASA's Wallops Flight Center, done as a project of the Marine Science Consortium at Wallops, Va. The consortium used the Wallops center sewage lagoon to study propagation and survival rates in winter of water hyacinths.

Guest speakers were Nelson Milder, program manager, NASA headquarters and Dr. B. C. Wolverton, environmental scientist at NSTL, the man who worked on this technology for several years before proving that vascular aquatic plants, particularly water hyacinths, can be used as a natural biological filtration system for industrial and sewage waste.

Another guest speaker was Ken Turgeon, Research Scientists, Marine Science Consortium, Wallops, Virginia who made a study of sample specimens flown to DTIG for research under Delmarva's weather conditions.

According to Milder, this project is a "unique experience for NASA." It all started when the state of Mississippi notified NSTL that the quality of its effluents did not meet state standards. NSTL, after considering several alternatives, decided to adopt the vascular plant filtration system. Wolverton, who had been looking for potentials inherent in the use of water hyacinths to remove pollutants from water, put the system into effect and the results proved it to be a simple and significant contribution to waste water problems. A number of agencies throughout the country have undertaken similar projects.

Wolverton explained that this technology began with a search for waste reuse and water recycling for life support in outer space. He gave a detailed description of his study and findings. As a result of his experiments, it was found that water hyacinths have the ability to assimilate nutrients and remove excess nitrates and phosphates from sewage.

The plant has these characteristics: it floats while its root systems feed on nutrients in the water; it is easy to harvest; it produces over 500 pound of dry plant material per acre every day; and it grows freely in warm climates under ideal conditions. He pointed out that, because of freezing temperatures on Delmarva, the plant would die, therefore it would be necessary to protect it in winter. Harvested plants can be converted into useful products such as animal feed, fertilizer and soil conditioner, or used as a source of bio-gas for fuel.

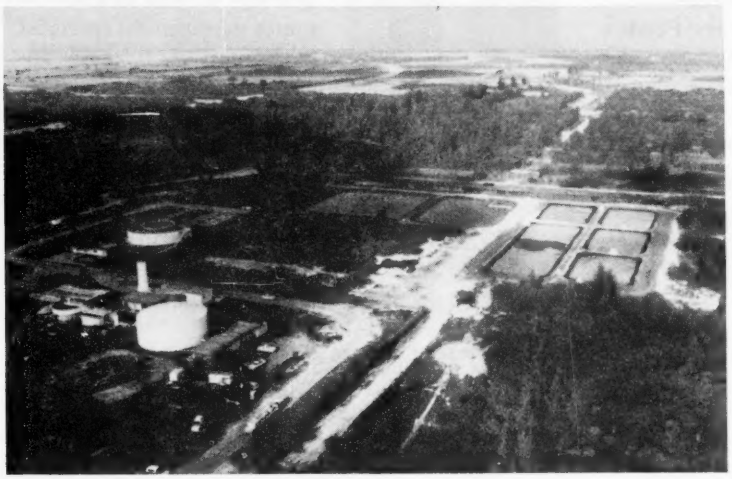
Water hyacinths may also be used to purify drinking water in small town areas. Through its purification cycle, it will remove nitrates, which act as fertilizers to the plant.

Turgeon worked with a sample of water hyacinths at the Marine Science Consortium, Wallops, Va. In October, 1977, the plants were specially flown to Delmarva from NSTL to study their growth habits under local weather conditions.

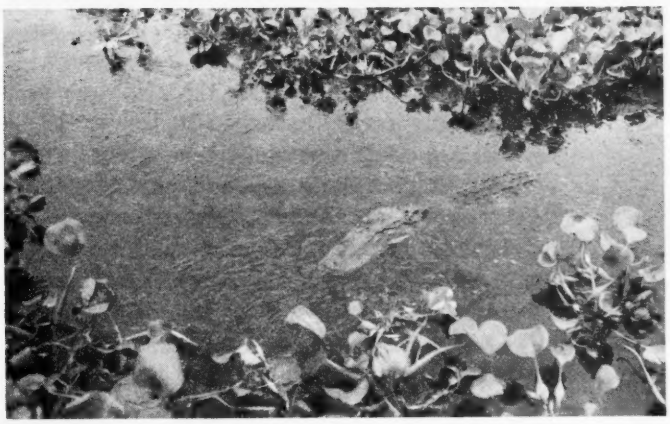
At Wallops, Turgeon set up three different systems for growing the plant: open sewage lagoon; sewage lagoon greenhouse covered with polyethylene; and dryland greenhouse insulated with foam, filled with sewage water and also covered.

The plants were monitored at two-week intervals. Those in the open lagoon did not do too well as temperatures fell and by November they were dead. Those in the second system survived until December, produced very few new plants, and as temperatures decreased further, got smaller stems, became shorter and fatter, and died. But the plants in the land greenhouse survived. Their root system remained intact

**Hyacinth Harvester**—Dr. B. C. Wolverton, environmental scientist at NSTL, inspects harvesting equipment at NSTL's water hyacinth sewage treatment facility.



**Florida System in Operation**—This five-pond water hyacinth treatment facility (right center) near Fort Lauderdale, Fla., is the first such system outside NSTL. It was installed from NASA technology with the technical advice of Dr. B. C. Wolverton.



**Elsewhere in the Lagoon**—A contented resident of of the NSTL sewage lagoon in Mississippi is this alligator who thrives in water that has been purified by water hyacinths.

and revived in the spring. This seemed to show that plant growth can be extended and potential utilization increased. There was no evidence of insect infestation or waterfowl feeding.

Turgeon's findings demonstrate the results of applying NASA's proven technology to Delmarva. Another important factor to introducing water hyacinths in Delmarva waters is that freezing temperatures and ice crystallization can, if need be, control overabundant growth.

In general, the conference concluded that the filtration system provided by water hyacinths is feasible for the Eastern Shore area. It is simple, inexpensive and economical. Industrialists, educators and county officials attending the conference seemed optimistic about utilizing it and were interested in getting started but were uncertain as to how to proceed with such a novel proposition. The State of Virginia officially endorsed the importation of water hyacinths and experiments designed to test the feasibility of propogation in state experiments. Food processors and poultry farmers in Delmarva who are interested in this technology are being informed and assisted by Wallops technology utilization officer Gilmore H. Trafford.

In a related and significant development, the California Water Resources Control Board has requested that Wolverton serve on a panel of experts, now in formative stages, to study the advisability of building a water hyacinth system in San Diego to control pollution. If affirmative decisions are reached, the panel will apply to the Environmental Protection Agency to fund 75 percent of the project (envisioned as perhaps $3 million) under Public Law 92,500. A 1972 amendment spells out the details of how EPA funds are to be distributed by EPA to improve water quality in the United States.

Also, in Florida, a water hyacinth treatment system, the first such treatment system outside NSTL, has been installed by Coral Ridge Properties, Inc. at Coral Ridge (near Fort Lauderdale).

The system was installed from NASA-developed technology and technical assistance from Wolverton. It handles 100,000 gallons per day of waste water and consists of five small ponds in series, each with a surface area of about 0.25 acres. The purpose of the system is to treat the outflow of an activated sludge plant which is operated as an extended aeration plant with a flow rate of about 400,000 gallons per day. By Jan. 1, 1980, waste-water treatment plants in Florida will be required to produce an effluent that meets advanced waste treatment criteria before it is discharged into the receiving waters.

The system has been in operation for some three months and optimum adjustments and retention times are still being made, in consultation with Wolverton. Results to date look very good.

## New Director for Dryden Flight Research Center

Isaac T. Gillam, IV, was named director of NASA's Dryden Flight Research Center effective June 18. Gillam had been acting director of Dryden since November 1977.

He joined NASA headquarters in 1963 as a resource management specialist. In February 1966, he was appointed assistant program manager for the Delta launch vehicle and in 1968 he became Delta program manager. In June 1973, he was appointed program manager, small launch vehicles and international projects.

In 1976, he left NASA headquarters to become Director of Space Shuttle operations at Dryden, and was named deputy director of Dryden in August 1977.

Before he joined NASA, Gillam served in the U.S. Air Force from 1953 to 1963 as a pilot, missile launch crew commander for the Strategic Air Command and as an assistant professor of air science in the Air Force ROTC program at Tennessee State University.

Gillam was born in Little Rock, Ark. in 1932. He earned a B.S. degree in mathematics from Howard University, Washington, D.C., in 1953. He also pursued graduate work at Tennessee State University. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics, a senior member of the American Astronautical Society, and a member of the Air Force Association, the National Defense Preparedness Association and the American Management Association.

Among his numerous awards is NASA's highest award, the Distinguished Service Medal, for his work on the NASA launch vehicles program.

## Associate Deputy Administrator Appointed

Robert F. Allnutt became NASA's Associate Deputy Administrator on July 2. In this senior staff position, he reports to the Administrator and the Deputy Administrator.

Allnutt had been the acting assistant general counsel for legislation for the Department of Energy. He joined the department's predecessor, the Energy Research and Development Administration in June 1975, as the deputy assisant administrator (administration). In that assignment, he was responsible for a wide variety of program areas, including procurement, personnel, labor relations, and construction. He received the ERDA Meritorious Services Award for 1976.

On the basis of his experience with the U.S. Patent Office, which he joined in 1957, Allnutt subsequently served as a patent attorney with NASA, an attorney for the Communications Satellite Corp., and the NASA assistant general counsel (patents). In 1967, he was made NASA's assistant administrator for legislative affairs, and then served as a member of the Apollo 13 accident review board while assistant to the Administrator.

In 1970, Allnutt was appointed associate general counsel for the Congressionally established Commission on Government Procurement, where he advised the commission on its responsibilities for recommending improved government-wide policies, procedures, and legislation. In 1973, he was appointed staff director and counsel of the Senate Committee on Aeronautical and Space Sciences, the committee that has jurisdiction over Federal aerospace research and development activities and over all NASA programs.

A native of Richmond, Va. Allnutt, 43, graduated from Virginia Polytechnic Institute in 1957 with a B.S. degree in industrial engineering. He received his law degree from George Washington University, earning a Juris Doctorate (with distinction) in 1960 and a Master of Laws in 1962. He is author and co-author of a number of law review articles, and was a lecturer in law at American University in 1964. He is a member of the Supreme Court of Virginia, and District of Columbia bars, and is active in the American Bar Association and the Federal Bar Association.

## Honors Awarded 37 NASA Headquarters Employees

At ceremonies held in May 1978, 37 employees in four categories received honor awards at NASA headquarters. C. T. Newman, chairman of the Incentive Awards Committee welcomed recipients and several hundred visitors; Administrator Dr. Robert A. Frosch and Deputy Administrator Dr. Alan M. Lovelace presented the awards.

Winners were: **Exceptional Performance Award** (Science and Engineering) —James C. Bavely, Elbert L. Eaton, Joseph L. Murphy, and C. Robert Nysmith; (Administrative) Suzanne S. T. Garner, Werner Gruhl, Lloyd E. Jones, James C. Molloy, David W. Thompson, Peggy P. Christian, Patricia A. Nash, Juanita W. Richardson, Willis H. Rickert, Tiyette N. Rogers; (Administrative Support, and Trades) Yu Ta Chang, Margaret L. Elliott, Carole A. Guntharp, Janice D. Jackson, Amy L. Smith; (Secretarial/ Clerical) Marion J. Bailey, Joellen J. Copper, W. Joy Herndon, Nora J. Lamanteeer, Barbara A. Light, Annette C. Pitts, Barbara A. Warren, Donna W. Welebir. **Space-Ship Earth Award**—Robert D. Cromwell, Earl L. Ginyard, McFarland J. Steel. **EEO Achievement Award**—Clarence E. Catoe, Stephen E. Dwornik, Wilson James, Jr. **Cooperative External Achievement Award**—A. A. DeSimone, Lillian R. Levy, Jesco H. von Puttkamer, and Donna J. Skidmore.

## Booster Tested in Airdrop

An airdrop test of the parachute system that will lower the Space Shuttle's reusable solid rocket boosters to Earth after launch was successfully conducted May 23 at the National Parachute Test Range, El Centro, Calif.

This was the fourth drop test in which a dummy booster was carried aloft beneath the right wing of a B-52 aircraft. The recovery system's three main parachutes were deployed.

Royce Mitchell, the Marshall Space Flight Center engineer in charge of the program, said that all systems functioned as expected and that the dummy booster landed virtually undamaged. Two additional air-drops are planned before the system is certified for flight.

## Crow Announces Departure Plans

Duwald L. Crow (Lt. Gen., USAF, ret.), assistant to the Deputy Administrator of NASA, has announced his plans to leave NASA Sept. 1, 1978. He joined NASA in September 1974 as Assistant Administrator for DoD and Interagency Affairs. In October, 1975, he was appointed Associate Deputy Administrator of NASA. Following the reorganization of NASA in November, 1977, he assumed his present duties.

Born in Fort Payne, Ala., in 1919, he graduated from the U.S. Military Academy in 1941. His World War II service was in the China-Burma-India theatre of operations. Following the war, Crow earned a Master's degree at the Harvard Graduate School of Business Administration and then advanced through a series of Air Force logistics, materiel and comptrollership posts.

In 1958, Crow graduated from the Air War College. After service as comptroller of the Air Force Systems Command, he became Director of Budget for the Air Force in 1964, then comptroller of the Air Force in 1969. His final Air Force assignment was Assistant Vice Chief of Staff from October 1973 to July 1974. He retired from the Air Force in 1974. His decorations include the Air Force Distinguished Service Medal with oak leaf cluster, the Legion of Merit, the Bronze Star Medal and the Army Commendation Medal.

## Smithsonian Scientist to Advise President Sadat

Dr. Farouk El-Baz will provide advice on scientific matters to Anwar Sadat, President of the Arab Republic of Egypt. The Government of Egypt made the request to the United States government through the American Ambassador in Cairo. In the letter acceding to the request, the Smithsonian Institution stated that providing such advice on scientific matters "would be entirely consistent with Dr. El-Baz's function at the Smithsonian to foster the increase and diffusion of knowledge among men. Moreover, the Smithsonian would be happy to facilitate this work of Dr. El-Baz by providing liason with the scientific community, should it be deemed appropriate."

El-Baz will be performing this duty in addition to his responsibilities as research director of the center for earth and planetary studies at the National Air and Space Museum. He expects to be asked to advise President Sadat in matters related to the mapping and exploration of Egypts' deserts.

El-Baz's research as a geologist has been affiliated with the American space program since 1967. He participated in the selection of landing sites for the Apollo lunar landings and was responsible for the training of the astronauts in geological observations and orbital photography. Since he joined the Smithsonian in January 1973, he has been conducting research on the Moon and Mars as well as the applications of space technology to the study of world deserts.

**Space Telescope**—Work is now underway on a huge primary mirror blank for NASA's Space Telescope, a 10-ton unmanned observatory scheduled to be launched tion than ground-based telescopes; and it will be able to see Space Telescope is expected to have 10 times better resolution than ground-based telescopes; it will be able to see objects that are 50 times fainter and seven times farther away than those we now observe. NASA's Marshall Space Flight Center has overall management responsibility for the telescope. The primary mirror blank is being manufactured at the Corning Glass Works, Canton, N.Y. under contract to Perkin-Elmer Corp., Danbury, Conn., prime contractor for the instrument's optical telescope assembly. After delivery, scheduled for late 1978, the laborious process of grinding and polishing the glass to its optical curvature will begin.

## Impaired Employees Get A Break

The Management Colloquium Committee at the Goddard Space Flight Center recently began providing sign language interpreters and Braille announcements for its colloquium series. NASA Administrator Dr. Frosch was the first of several speakers under this new program. Goddard's Advisory Committee on Handicapped Employees has recommended that the services be continued.

The management colloquium committee, an interdisciplinary group, sponsors several forums a year for discussion of current and future trends in the management of science and technology. Committee members had long felt that some employees, in particular the hearing and visually impaired, were not able to participate in these forums. They contacted Don Parker, president of Goddard's Advisory Committee of Handicapped Employees.

As a result, when Frosch was on stage speaking, a professional sign language interpreter, Mike Hartman, was also on stage, translating Frosch's speech for the hearing impaired employees in the audience. Frosch's oral and "signed" remarks were carried live on Goddard's closed circuit television.

For the visually impaired employees, a Braille announcement advertising the colloquium was prepared using a special computer program written by Robert Lagrone, a blind programmer at IBM. This program was obtained by Goddard in 1969 and installed on the Science and Applications Computing Center's machines. The English-to-Braille translation for the colloquium announcement was accomplished in less than one second. The Braille computer printout requires that a computer operator spend a few seconds setting standard type pressure and paper thickness controls on the printer and placing a premade elastic strip across the print hammer to give a soft backing against which the Braille dots made by the printer's normal period key will be more sharply defined. Rhoda Hornstein of the Management Colloquium Committee learned how to use the Braille program to produce colloquim announcements from a Goddard employee who must rely on this program to do his job. He is John Bogert, a mathematician in the observatories and data analysis branch.

Employees with and without visual or hearing problems attended.

**Let The Fingers Do The Talking**—NASA Administrator Frosch's remarks at recent Goddard forum are relayed in sign language by Mike Hartman for the benefit of employees who have impaired hearing.

**Message Is Hand Carried**—Catherine Kaebacher uses sign language to convey to hearing-impaired Goddard employees the forum remarks of Dr. Jordan Baruch, U.S. Assistant Secretary of Commerce for Science and Technology.

## Langley Man to Work with State Educational Program

Harold E. Mehrens, chief of the Langley Research Center's office of educational programs has accepted an invitation to serve on the newly formed advisory committee for the Virginia Polytechnic Institute and State University's division of vocational and technical education. The mission of the organization is to provide leadership for the preparation of vocational teachers, administrators and other support personnel. Comprehensive undergraduate and graduate degree programs have been linked to an extensive research and development effort in the State.

Mehrens worked for NASA at the Kennedy Space Center beginning in 1964 until 1969. There he received a White House letter of commendation for creation of the KSC student tour program. Later he became assistant manager of the NASA space science education project at headquarters. Before NASA, Mehrens was a teacher.

He has won numerous professional awards, including NASA's Superior Achievement Award in 1969.

A native of New Mexico, Mehrens did undergraduate work at Eastern New Mexico University. He did graduate work at the University of Maryland.

## Contractor News

**Computer Science Corp.** of Falls Church, Va. has been selected for negotiations leading to the award of a cost-plus-award-fee contract for performance of institutional computer systems engineering, development and production operations work at Johnson Space Center, Houston, for a give-year period. Estimated cost for the first three years is approximately $40 million. Computer Sciences will perform systems engineering and definition, applied software development and computer systems and related facility planning and development for the Central Computing Facility (CCF) and computer operations for the CCF and Mission Control Center. The computer operations function includes equipment operations, job scheduling and processing, dispatch services, job quality control, maintenance of tape libraries, production coordination and other related tasks.

**Pan American World Airways, Inc.** has been selected for negotiations leading to the award of a contract for support services for facility operations at NASA's National Space Technology Laboratories. Estimated cost for the first three years of this cost-plus-award-fee contract is $32 million. Starting date is Oct. 12, 1978, and there are two one-year unpriced options. Services covered are: operation and maintenance of the NSTL real and installed property institutional services, supply and equipment management, construction services, and installation services.

**W&J Construction Corp.,** Cocoa, Fla., has been granted a contract for $3,119,000 for the modifications required to transform a spacecraft processing facility in the KS industrial area into the vertical processing facility for Space Shuttle payloads. The work entails extensive modifications to the high and low bays, airlock, deluge sprinkle systems, air conditioning and plumbing systems, and miscellaneous site, structural and mechanical work. The work under the fixed-price contract is to be completed within 300 calendar days. Automated satellites and other payloads will undergo final assembly and checkout in the vertical processing facility before they are inserted into the payload canister which will be used to transport them to the launch pad for mating with the Space Shuttle.

**Planning Research Corp.** of McLean, Va., has been awarded a $23,626,661 contract extension by the John F. Kennedy Space Center for engineering support services. The 12-month cost-plus-fixed-fee extension provides for the company to continue design engineering services for Space Shuttle equipment and other engineering activities from May 20, 1978 through May 19, 1979. Services include the design of new and modified ground support equipment and minor facilities design support for all center programs. Included among the company's employees are engineers, draftsmen, technical writers and computer programmers. Support is provided at the Spaceport and Cape Canaveral AFB in Florida, and at Vandenberg AFB and NASA's Dryden Flight Research Center in California. The extension brings the total amount of the contract since the original award in May 1974, to $97,306,220.

**Boeing Services International Inc.,** Seattle, Wash., has been awarded a $24,071,643 extension of its ground systems operations contract. The contract covers the period July 1, 1978, to June 30, 1979.

The renewal brings the cumulative value of the present contract to $67,143,012. Services to be performed at the Kennedy center under the contract cover facility and utility operations and maintenance, including propellants; cranes, doors and platforms; elevators; services and shops; nondestructive evaluation; life support, and industrial operations.

**McDonnell Douglas Technical Services Company, Inc.,** has been awarded a third increment extension to its contract for Space Shuttle engineering and operation support at the Johnson Space Center. The two-year cost-plus-award-fee follow-on to the contract, which expired March 31, 1978, is valued at $33.4 million, bringing the cumulative extension add-on to a total of $66.4 million.

**Computer Sciences Corp.'s Applied Technology Division,** Falls Church, Va. has been awarded a $11,107,658 contract extension by the Kennedy Space Center for communications and instrumentation support services. The cost-plus-award-fee extension provides for Computer Services and its subcontractor, the RCA Service Company, Cherry Hill, N.J., to continue support in the areas of communications, measurements, telemetrics, scientific and administrative computer services, data storage and retrieval program planning, and reliability and quality assurance programs. The extension is for a one-year period beginning June 1, 1978, and raises the contract total to $31 million. Data acquisition and data processing for KSC's manned and unmanned launches and administrative programs, instrumentation of launch control center firing rooms and the operation of timing systems are among the support services provided under the contract.

**Pan American World Airways Inc.** has won a $1,710,601 one-year extension of its occupational medicine and environmental services contract at the Kennedy Space Center. The extension covers July 1, 1978 to June 30, 1979 and brings the total value of the basic contract to $3,320,850. This is the second of four one-year optional extensions under the cost-plus-fixed-fee contract. Pan American will provide the services for civil service, military and contractor personnel, supporting both NASA's Kennedy Space Center and Cape Canaveral Air Force Station. Services are performed by physicians, medical technicians, nurses, and environmental specialists.

**Expedient Services, Inc.,** Titusville, Fla., has been awarded a one-year, $1,081,743 contract extension for roads and grounds services at the Kennedy Space Center. The extension covers July 1, 1978 to June 30, 1979, and includes options to extend through June 30, 1980. The cost-plus-fixed-fee contract set aside for disadvantaged firms, was awarded by the Small Business Administration of Atlanta, Ga., on behalf of the Kennedy Space Center. The Titusville firm will provide roads and grounds services, including roadway grass mowing and care, landscape maintenance, pest control, trash pickup and disposal.

**Management Services, Inc.,** of Huntsville, Ala., has received a $1,774,404 contract extension from the Kennedy center to operate the spaceport's component refurbishment and chemical analysis laboratories. The one-year extension is for June 1, 1978 through May 31, 1979. The cost-plus-award-fee contract is a setaside for small businesses. The $1,774,404 extension brings the total value of the original contract to $4,536,339.

# Did You Know?

**One of the gifts** presented by national security adviser Zbigniew Brzezinski to Chinese Foreign Minister Huang Hua was a Chinese flag flown to the Moon and back in 1972 by the astronauts of Apollo 17. The flag was one of four Chinese flags taken to the Moon, two going on Apollo 16 and two more on Apollo 17 which carried the flags of all 148 countries which were members of the United Nations at the time. The other three Chinese flags are in storage at the Johnson Space Center at Houston where they'll stay until a U.S. dignitary asks for one to give as a ceremonial gift.

**The U.S.-Soviet Working Group** on Near-Earth Space, the Moon, and the Planets met in Innsbruck Austria June 7–9. The U.S. Delegation was headed by Dr. Noel Hinners and the Soviet Delegation by Academician B. Petrov. The group discussed their principal lunar and planetary science objectives, including their respective Venus missions planned for 1978 and possible Venus missions in 1983.

**July 7, 1978 was a big day** for the newly-launched Seasat 1. All its sensors were turned on simultaneously that day and a group of domestic and international laser stations began operational support of the oceanographic satellite. The satellite was launched

June 26 from Vandenberg Air Force Base in California. A retroreflector rings the base of the spacecraft, permitting laser tracking on scheduled passes.

**Mars: The Viking Discoveries,** EP–146, a NASA curriculum supplement produced by the Office of Public Affairs and written by Dr. Bevan French of the headquarters Office of Space Science, received a first place in the technical publications category of the National Association of Government Communications.

## Patents for Inventions from NASA Research

*The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Counsel of the indicated installation.*

| Inventor(s) and Employer | Title | Patent No. | Installation |
|---|---|---|---|
| Leonard M. Weinstien, LaRC | Contrast enhancement and small detail blending of photographic images | 4,093,460 | LaRC |
| William C. Stange, GSFC | Actuator mechanism | 4,092,874 | GSFC |
| Robert L. Kurtz, MSFC | Hybrid holographic non-destructive test system | 4,093,382 | MSFC |
| Walter Robert Leeb<br>National Academy of Sciences<br>Washington, D.C. | Method and apparatus for splitting a beam of energy | 4,093,354 | GSFC |
| Paul L. Coe, Jr., LaRC<br>Howard E. Goldstein) ARC | Supersonic transport | 4,093,156 | LaRC |
| Daniel B. Leiser ) Stanford Univ.<br>Victor E. Katvala ) ARC | Reaction cured glass and glass coatings | 4,093,771 | ARC |
| Walter Haeussermonn, MSFC | Velocity measurement | 4,093,917 | MSFC |
| Pasupati Sadhukhan, Occidental Research Corp.<br>Alexis T. Bell, University of Calif., Berkeley, Calif. | Process for preparing higher oxides of the alkali and alkaline metals | 4,094,758 | ARC |

## Launches for 1978—Completed and Projected

| Name | Launch Date | Vehicle | Range | Mission Remarks |
|---|---|---|---|---|
| Intelsat IVA-(F) | Jan. 7 | Atlas-Centaur | ETR | Improved communications satellite for Comsat. Reimbursable. |
| IUE-A | Jan. 26 | Delta | ETR | International Ultraviolet Explorer—cooperative with ESA. Designed to obtain high resolution data on stars and planets in the ultraviolet region of the spectrum. |
| FLTSATCOM-A | Feb. 9 | Atlas-Centaur | ETR | Navy fleet satellite communications. Reimbursable. |
| Landsat-C | March 5 | Delta | WTR | Third Earth resources technology satellite. |
| Intelsat IVA-F6 | March 31 | Atlas-Centaur | ETR | Improved communications satellite for Comsat. Reimbursable. |
| Japan/BSE-A | April 7 | Delta | ETR | Broadcasting satellite experimental. Japanese communications satellite for conducting TV broadcast experiments, Reimbursable. |
| AEM-1 (HCMM) | April 26 | Scout | WTR | Heat capacity mapping mission to produce thermal maps for thermal intertial measurements, investigate feasibility of geothermal source location by remote sensing, and provide coverage of snow field for water runoff prediction. |
| OTS-B | May 11 | Delta | ETR | ESA orbital test satellite. |

| | | | | |
|---|---|---|---|---|
| Pioneer Venus-A | May 20 | Atlas-Centaur | ETR | Planetary mission to Venus. Orbiter will measure upper atmosphere and ionosphere, study interaction between solar wind and ionosphere and magnetic field, study atmospheric and surface characteristics, determine gravitational field harmonics. |
| NOAA/ GOES | June 16 | Delta | ETR | Part of global network of geostationary environmental satellites to provide Earth imaging, monitor the space environment, and relay meterological data to users. Remibursable. |
| Seasat-A | June 26 | Atlas-F | WTR | Sea satellite for global monitoring of ocean geoid, wave topography, surface wind speed and direction, ocean surface temperature, and ice field extent and dynamics. |
| Comstar-C | June 29 | Atlas-Centaur | ETR | Third in a series of domestic communications satellites for Comsat. Reimbursable. |
| ESA/GEOS-B | July 14 | Delta | ETR | ESA spacecraft to conduct scientific, investigation of waves and particles in magnetosphere. Reimbursable. |
| Pioneer Venus-B | Aug. 7 | Atlas-Centaur | ETR | Multiprobe—will determine nature and composition of clouds, composition structure and general circulation pattern of the atmosphere of Venus from the surface to high altitudes, study interaction between planetary environment and interplaneary medium. |
| ISEE-C | Aug. 12 | Delta | ETR | International Sun Earth Explorer. An extension of interplanetary studies with the spacecraft toward the Sun sufficiently outside the Earth's influence for comparison with results of ISEE-A and B missions and of space probes to outer planets. |
| Japan Backup | Sept. | Delta | ETR | Backup spacecraft for Japan. |
| Navy-20 | Sept. | Scout | WTR | Navy navigation satellite. Reimbursable. (Call-up.) |
| NOAA-A | Sept. | Atlas-F | WTR | Advanced operational prototype spacecraft and sensors for a third generation series of operational meteoroligical satellites. Reimbursable. |
| Nimbus-G | Sept. 18 | Delta | WTR | Develop and flight test advanced sensors and technology basic to conducting experiments in the pollution monitoring, oceanographic, and meteorological disciplines. |
| TIROS-N | Sept. 15 | Atlas-Centaur | WTR | Polar orbiting operational spacecraft to provide and improve meteorological data. |
| NATO III-C | Oct. | Delta | ETR | Communications satellite, second in series. |
| HEAO-B | Oct. | Atlas-Centaur | ETR | Second high energy astronomical observatory to study highly energetic radiation from space. |
| Telsat-D | Nov. | Delta | ETR | Canadian domestic communications satellite. Reimbursable. |
| FLTSATCOM-B | Dec. | Atlas-Centaur | ETR | Navy fleet satellite communications. Reimbursable. |

# Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

## Eye Surgery Light

A surgeon now uses an illuminating instrument called an opthalmoscope for close examination of the retina or the interior of the eye for eye surgery. Ordinarily, electric power for the head-mounted light is supplied through a cord from an overhead swivel arm or a floor pedestal. Within limits of cord length and swivel arm movement, the surgeon has considerable freedom of motion. But when more than one opthalmoscope is involved, tangling and interference of the power cords become a problem.

St. Luke's Hospital in Cleveland, Ohio asked the Lewis Research Center for assistance in finding a solution. Lewis responded with a battery-powered system that totally frees the surgeon of attached cords and swivels.

Borrowing from space technology, Lewis used small, lightweight nickel-cadmium batteries that can be recharged overnight. The opthalmoscope powerpack consist of eight batteries in three containers affixed to a webbed belt, and a novel on-off switch equipped with a spring-loaded plexiglass "flapper". The belt pack is worn underneath the surgical gown and the flapper permits the doctor to activate the switch by elbow pressure.

Lewis built five units, which have been in service at St. Luke's Hospital for a year. Used for routine examinations as well as for surgery, they have demonstrated excellent reliability.

**Throwing Light on Important Subjects**—The opthalmoscope used for close examination of the retina or the interior of the eye is worn by a surgeon at St. Luke's Hospital in Cleveland. The lightweight nickel-cadmium batteries in the instrument can deliver high-intensity light for an hour and can be recharged overnight.

**No Hands Needed**—Lewis-designed battery-powered opthalmoscope packs eight batteries on webbed belt with an on-off switch that can be operated by the eye surgeon's elbow and worn underneath the surgical gown.

NASA
National Aeronautics and Space Administration